

WHAT IS CLAIMED IS:

1. A method of screening agents for use in the prevention or treatment of cancer comprising:

5 (a) contacting a vegetative cell of *Dictyostelium discoideum* with a test agent;

(b) assessing the cytotoxicity of said test agent;

(c) assessing the effect of said test agent on the expression of one or more of *repB*, *repD* and *APE* gene products; and

10 (d) comparing said cytotoxicity and said expression in the presence of said test agent with a vegetative cell of *Dictyostelium discoideum* not exposed to said test agent;

15 wherein

(i) a test agent that is cytotoxic but does not induce expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemotherapeutic;

(ii) a test agent that is not cytotoxic but does induce expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemopreventative; and

20 (iii) a test agent that inhibits the expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemotherapeutic when applied in combination with a DNA damaging agent.

2. The method of claim 1, wherein assessing expression of *repB* is performed, and assessing expression of *repD* and *APE* is not performed.

3. The method of claim 1, wherein assessing expression of *repD* is performed, and assessing expression of *repB* and *APE* is not performed.

4. The method of claim 1, wherein assessing expression of *APE* is performed, and assessing expression of *repB* and *repD* is not performed.

5. The method of claim 1, wherein assessing expression of *repB* and *repD* is performed, and assessing expression of *APE* is not performed.

5 6. The method of claim 1, wherein assessing expression of *repB* and *APE* is performed, and assessing expression of *repD* is not performed.

7. The method of claim 1, wherein assessing expression of *repD* and *APE* is performed, and assessing expression of *repB* is not performed.

8. The method of claim 1, wherein assessing expression of *repB*, *repD* and *APE* is performed.

10 9. The method of claim 1, further comprising measuring, in a vegetative cell of *Dictyostelium discoideum* not treated with said test agent, the expression of the same gene or genes as measured in step (c).

15 10. The method of claim 1, wherein cytotoxicity is assessed by measuring clonal plating, trypan blue exclusion, phyloxine B dye exclusion, and degradation/laddering of DNA.

11. The method of claim 1, wherein expression is assessed by hybridization of a probe to a target nucleic acid.

12. The method of claim 11, further comprising RT-PCRTM.

20 13. The method of claim 12, wherein said probe is a member of a primer pair for RT-PCRTM and comprises a label.

14. The method of claim 13, wherein the label is a radiolabel, a fluorophore label, a chemilluminiscent label, an enzyme label or a ligand.

25 15. The method of 14, wherein the ligand is biotin, and the ligand is detected by contacting with enzyme-conjugated avidin and a detectable enzyme substrate.

16. The method of claim 11, further comprising binding target nucleic acid to a substrate.

17. The method of claim 16, wherein said substrate is a nylon or nitrocellulose membrane.

5 18. The method of claim 16, wherein said probe is labeled with a radiolabel, a fluorophore label, a chemilluminiscent label, an enzyme label or a ligand.

10 19. The method of claim 1, wherein expression is assessed by means of an expression cassette stably transformed into said a vegetative cell of *Dictyostelium discoideum*, said expression cassette comprising a nucleic acid segment encoding a detectable reporter enzyme under the transcriptional control of a *repB*, *repD* or *APE* promoter region.

20. The method of claim 19, wherein said detectable reporter enzyme encodes β -galactosidase, β -glucuronidase, luciferase or green fluorescent protein.

15 21. The method of claim 1, wherein said assay further comprises a positive control for inhibition of expression of one or more of *repB*, *repD* and *APE* gene products.

22. The method of claim 1, wherein said assay further comprises a positive control for induction of expression of one or more of *repB*, *repD* and *APE* gene products.

23. The method of claim 1, wherein said assay further comprises a positive control for cytotoxicity.

20 24. The method of claim 1, wherein said assay further comprises a negative control for inhibition of expression of one or more of *repB*, *repD* and *APE* gene products.

25. The method of claim 1, wherein said assay further comprises a negative control for induction of expression of one or more of *repB*, *repD* and *APE* gene products.

26. The method of claim 1, wherein said assay further comprises a negative control for cytotoxicity.

27. The method of claim 1, wherein said test agent is a naturally-occurring molecule.

28. The method of claim 1, wherein said test agent is a synthetic molecule.

29. The method of claim 1, wherein said test agent is a synthetic derivative of a naturally-occurring molecule.

5 30. The method of claim 1, further comprising assessing DNA damage in said cell.

31. The method of claim 30, wherein assessing DNA damage comprising mass spectroscopy.

32. A vegetative cell of *Dictyostelium discoideum* stably transformed with an expression cassette comprising a nucleic acid segment encoding a detectable reporter enzyme under the transcriptional control of a *repB*, *repD* or *APE* promoter region.

10 33. A method of making a compound for use in the prevention or treatment of cancer comprising:

15 (a) contacting a vegetative cell of *Dictyostelium discoideum* with said compound;

(b) assessing the cytotoxicity of said compound;

(c) assessing the effect of said compound on the expression of one or more of *repB*, *repD* and *APE*;

(d) comparing said cytotoxicity and said expression in the presence of said compound with a vegetative cell of *Dictyostelium discoideum* not exposed to said compound; and

20 (e) making said compound.